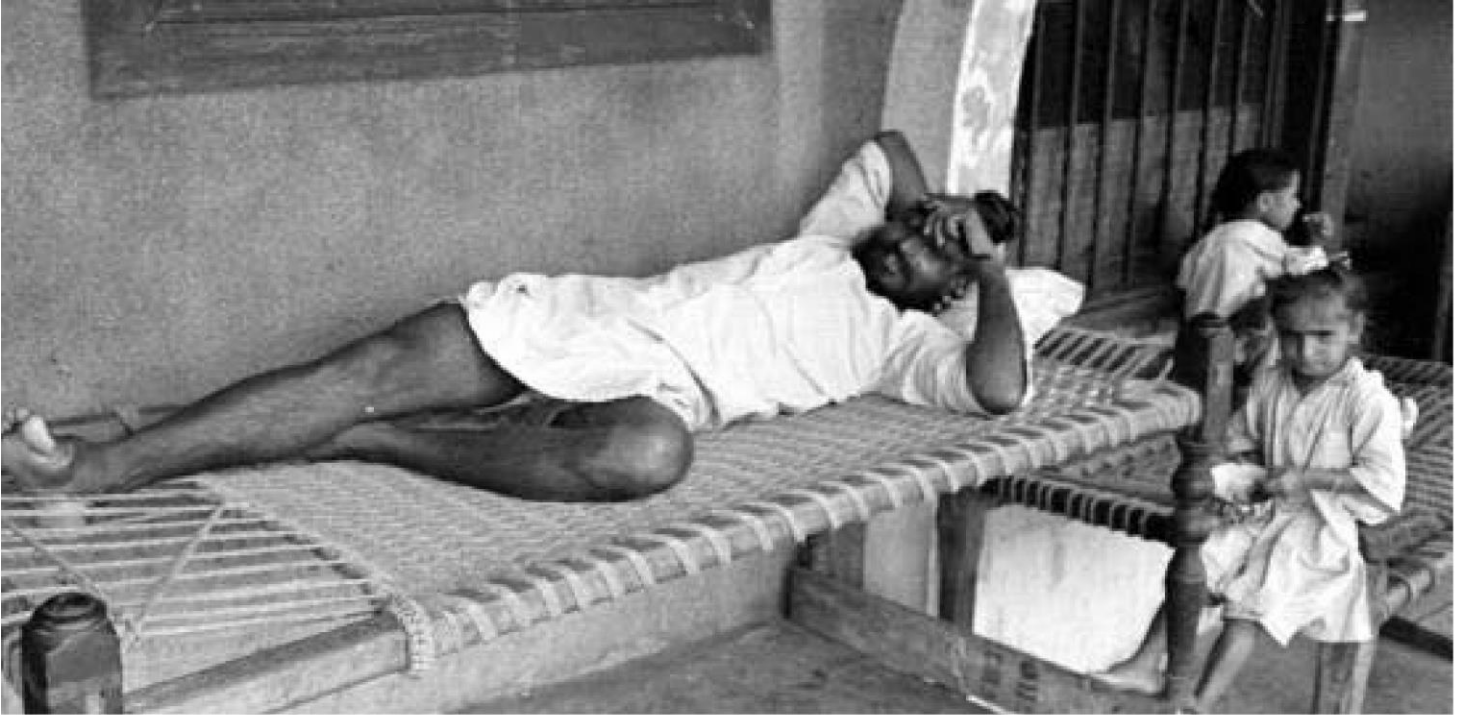


A jaga on a charpoy in Malaya. Photo from The Long and Winding Road.

HEAT IN URBAN ASIA: PAST, PRESENT, AND FUTURE

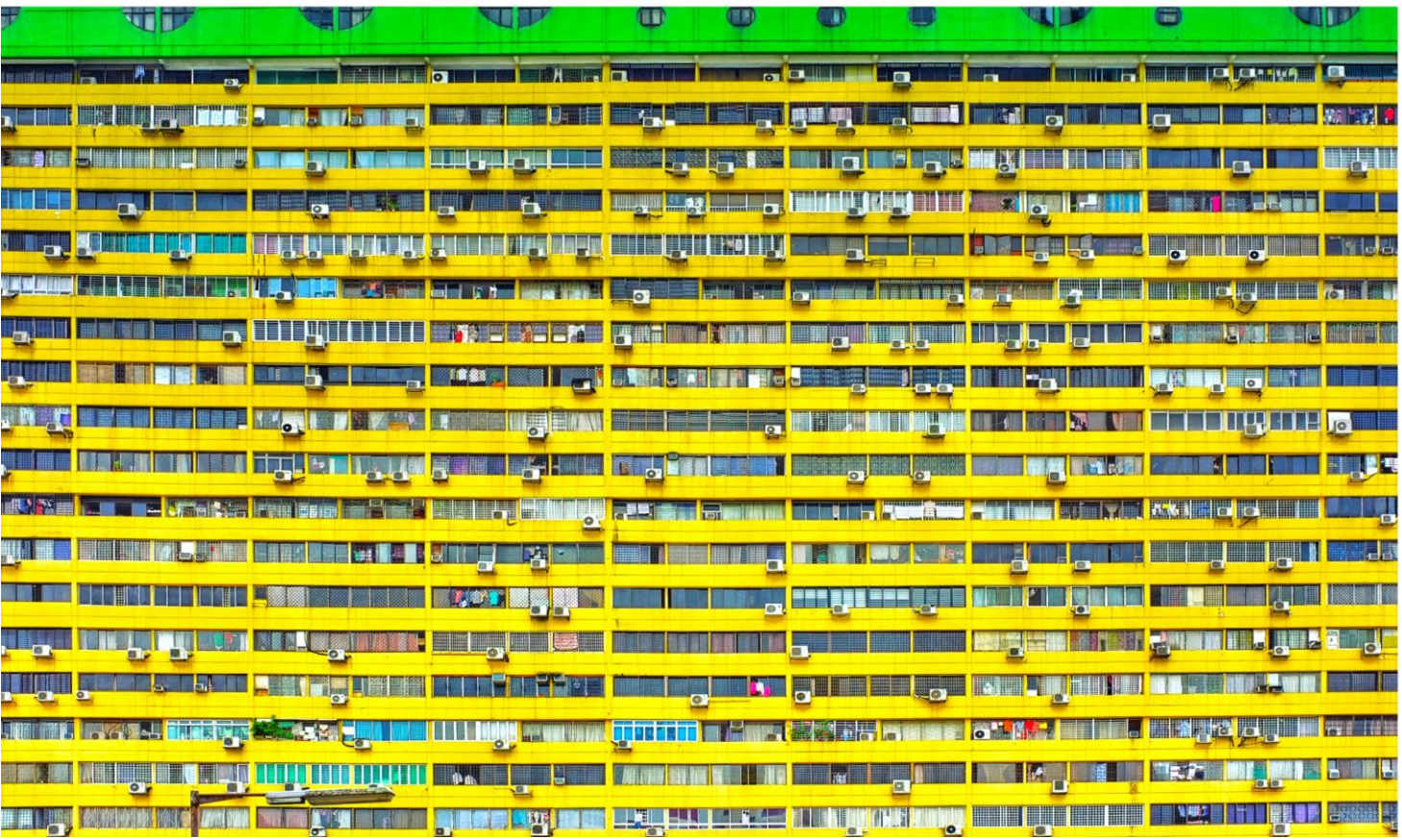
21-23 April 2021

Online via Zoom

ARI
ASIA RESEARCH INSTITUTE
National University of Singapore

ari.nus.edu.sg

Organised by the Science, Technology, and Society (STS) Cluster of the Asia Research Institute, National University of Singapore, with support from a MOE Tier 2 Grant.



People's Park Complex, Singapore. Photo by 贝莉儿 DANIST on Unsplash.

HEAT IN URBAN ASIA: PAST, PRESENT, FUTURE

The Science, Technology, and Society (STS) Cluster in the Asia Research Institute (ARI) at National University of Singapore (NUS) will host the workshop *Heat in Urban Asia: Past, Present, and Future* in April, 2021. This is the first academic workshop or conference to consider the phenomenon of heat in urban Asia from a social science and humanities perspective, though one also informed by research in the physical sciences, and with an eye to policy recommendations. Selected papers from the conference will be published in at least one special issue of a prominent international refereed journal.

The workshop is part of a larger project of the same name, funded by a Tier 2 grant from Singapore's Ministry of Education. It has three thematic parts, namely:

Taking the City's Temperature: The *Urban Heat Island (UHI)* effect, and the influence of city planning, design, and infrastructure-building on its escalation or mitigation. This includes the history, theory, and social impact of urban temperature-recording; universal vs. local definitions of heat and their implications; and the role and presence of Asian cities in the theorization of urban heat across a range of disciplines and professions.

Living with Heat: Documenting and theorizing *Asian Thermal Cultures*. This includes how Asian city dwellers have coped with the quotidian challenges of life in a hot environment; how heat exposure intersects with poverty, vulnerability, and inequality in dwellings and workplaces; heat and gender; heat and the shaping of material culture, from buildings to clothing to food & medicine, to technologies (e.g. air conditioning) to objects; and heat and national/ethnic identity.

Disastrous Heat (or, Not-Quite-Living with Heat): Documenting and theorizing extreme heat events in Asian cities. This includes the phenomenon of the *Heat Wave* and its construction (or absence) across cultures and borders; heat and emergency management regimes; heat as an emergent public health crisis, and differing metrics of mortality, and morbidity; and limits on adaptability to heat in an urban setting.

WORKSHOP CONVENORS

Dr Yoonhee JUNG
Asia Research Institute, National University of Singapore

Assoc Prof Gregory CLANCEY (PI)
Asia Research Institute, and Department of History, National University of Singapore

Asst Prof Fiona Clare WILLIAMSON (Co-PI)
Department of Science, Technology and Society, Singapore Management University

Assoc Prof Jiat-Hwee CHANG (Co-PI)
Department of Architecture, National University of Singapore

EXTERNAL CONVENORS

Asst Prof Christopher J. COURTNEY
Department of History, Durham University, UK

Prof Amita BAVISKAR
Department of Environmental Studies, and Department of Sociology and Anthropology,
Ashoka University, India

21 APRIL 2021 • WEDNESDAY

16:00 – 16:50	OPENING & INTRODUCTORY REMARKS
16:00	**Gregory Clancey** | National University of Singapore
16:05	**Johnny Chan** | City University of Hong Kong
16:20	**Aurel Moise** | Centre for Climate Research Singapore
16:35	**Winston Chow** | Singapore Management University
16:50 – 17:00	**BREAK**
17:00 – 18:00	**PANEL 1 • HEAT AND URBAN ENVIRONMENT**
Chairperson	**Jiat-Hwee Chang** | National University of Singapore
17:00	**The Idea of the Climate-Responsive City** **Sascha Roesler** | Università della Svizzera Italiana, Switzerland
17:15	**Beyond Tropicality: Heat and Colonial Weather Science in the Straits Settlements C. 1820-1900** **Fiona Williamson** | Singapore Management University
17:30	**Urban Heat Island in Transformation in Singapore** **Yoonhee Jung** | National University of Singapore
17:45	**Turning up the Heat: The Increasing Risk of Summer Fire in New Delhi** **Greg Bankoff** | University of Hull, UK **Steve Jordan** | Greater Manchester Fire and Rescue Service, UK
18:00	**END OF PANEL**

18:30 – 19:30	PANEL 2 • LIVING WITH HEAT IN DAILY LIFE
Chairperson	**Gregory Clancey** | National University of Singapore
18:30	**The Birth of Cool: A Cultural and Technological History of Heat in Wuhan, 1950-2019** **Chris Courtney** | University of Durham, UK
18:45	**The Urban Ecology of Ice** **Amita Baviskar** | Ashoka University, India
19:00	**Living with Heat: Exploring the Concept of Heat in Ayurveda, Biomedicine, and Tropical Medicine** **Ashawari Chaudhuri** | National University of Singapore
19:15	**Gateway to Cold: Drinks in Colonial Singapore** **Nicole Tarulevicz** | University of Tasmania, Australia
19:30	**END OF PANEL**

22 APRIL 2021 • THURSDAY

17:00 – 18:00	PANEL 3 • TECHNOLOGY, INFRASTRUCTURES, AND THERMAL COMFORT
Chairperson	**Chris Courtney** | University of Durham, UK
17:00	**Engineering the Urban Climate: The Thermal Modulation of Outdoors?** **Simon Marvin** | University of Sheffield, UK
17:15	**Thermal Governance, Circuits of Hydrocarbons, and the Architecture of Carbonized Comfort** **Jiat-Hwee Chang** | National University of Singapore
17:30	**Urban Energy Landscape in Practice: Architecture, Infrastructure and the Material Culture of Cooling in Post-Reform Chongqing (PR China)** **Madlen Kobi** | Università della Svizzera Italiana, Switzerland
17:45	**Constructing Modern Freshness: Refrigeration and Food Consumption in 1930s Shanghai** **Zhengfeng Wang** | University College Dublin, Ireland
18:00	**END OF PANEL**

18:30 – 19:30	PANEL 4 • POLITICS AND DISCOURSES ABOUT HEAT
Chairperson	**Fiona Williamson** | Singapore Management University
18:30	**The Political Ecology of Bangkok's Unequal and Unjust Urban Heat Island** **Danny Marks** | Dublin City University, Ireland **Kittima Leeruttanawisut** | UN Habitat, Thailand
18:50	**Technocracy and Soldier Centrism: A History of Heat Stress Management in the Singapore Military** **Joshua Dao Wei Sim** | National University of Singapore **Jason Kai Wei Lee** | National University of Singapore
19:10	**'A Hill Station for Whom?': Hill Stations and the Racialized Politics of Coping with Heat in Colonial Malaya and the Philippines, 1920s-1930s** **Claire Lowrie** | University of Wollongong, Australia
19:30	**END OF PANEL**

23 APRIL 2021 • FRIDAY

17:00 – 18:00	PANEL 5 • HEAT, HEALTH, AND GOVERNANCE
Chairperson	**Yoonhee Jung** | National University of Singapore
17:00	**Heat in a Time of Corona: An Analysis of the Nexus of Thermal Practices and Virus Transmission Management in Three Cities** **Elspeth Oppermann** | Ludwig Maximilians University, Germany **Anindrya Nastiti** | Institute of Technology Bandung, Indonesia **Adam Abdullah** | Institute of Business Administration Karachi, Pakistan **Sulfikar Amir** | Nanyang Technological University, Singapore **Yemiko Happy Nandatama** | Lapor Covid 19 **Nausheen Anwar** | Institute of Business Administration Karachi, Pakistan
17:20	**Heat, Cold, and Climatic Determinism in Chinese Medicine** **Liz P.Y. Chee** | National University of Singapore **Dongxin Zou** | National University of Singapore **Gregory Clancey** | National University of Singapore
17:40	**Accounting for the Urban in Heat Action Planning and Fast Policy** **Aalok Khandekar** | Indian Institute of Technology Hyderabad **Jamie Cross** | University of Edinburgh, UK **Anant Maringanti** | Hyderabad Urban Lab, India
18:00	**END OF PANEL**

18:30 – 19:30	PANEL 6 • VULNERABLE GROUPS/CLASS AND GENDER
Chairperson	**Ashawari Chaudhuri** | National University of Singapore
18:30	**Negotiating Shade in Changing Urban Climates in South Asia** **Soha Macktoom** | Institute of Business Administration Karachi, Pakistan **Nausheen Anwar** | Institute of Business Administration Karachi, Pakistan **Jamie Cross** | University of Edinburgh, UK
18:50	**Mapping Vulnerable Groups in Urban Areas to Extreme Heat: Case Study in Ho Chi Minh, Vietnam** **Ha Bui Thi Minh** | University of Social Sciences and Humanities, Vietnam
19:10	**'India is Nice and Hot and Sunny': The Materiality of the Weather-World and Indian Diasporic Families' Lived Experiences of Heat in Urban India** **Utsa Mukherjee** | University of Southampton, UK
19:30 – 19:40	**CLOSING REMARKS**
	Gregory Clancey | National University of Singapore **Yoonhee Jung** | National University of Singapore
19:40	**END OF WORKSHOP**

The Idea of the Climate-Responsive City

Sascha ROESLER
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In the middle of the 20th century, the idea of a climate city, laid out on scientific principles, was a recurrent topic. It was the combination of new scientific approaches to urban microclimates, as developed in the interwar period in Germany and Austria, with elements of a deductive climatic determinism that generated the idea of climate-responsive urban models. Jeffrey Aronin, for instance, speaks of "a city plan laid out on scientific sunlight principles" (1953). Until the early 1960s, deductions based on climatic zones, and empirical investigations on urban microclimates formed two parallel and entangled trajectories that shaped architecture's approach to city climate. Climate deterministic figures of thought were still seamlessly combined with empirical series of measurements, for which the publications of the Olgyay brothers are exemplary (1963).

In my talk, the tradeoffs and entanglements between urban climatology and climatic determinism shall be discussed by scrutinizing the publications of selected architects (such as Ludwig Hilberseimer, Ernst Egli, Victor and Aladar Olgyay) and climatologists (such as Charles Ernest Brooks and Gordon Manley). By looking at the Asian case studies of these publications of the middle of the 20th century, the complex relationship between scientific knowledge and architectural solution, between climatic data and design methodology shall be elaborated. Ernst Egli for instance emphasized the unprecedented character of future cities in different climatic zones while at the same time highlighting the pre-industrial Indian town as a model for climate-responsive cities in Asia (1951). Until today, discussions on the climate-responsive city rely, as I will show, on this ambiguity to conceive design or science as the basis for action.

Sascha Roesler is an architectural theorist, working at the intersection of architecture, ethnography, and science and technology studies. Since 2016, he is the Swiss National Science Foundation Professor for Architecture and Theory at the Academy of Architecture in Mendrisio, Switzerland. Roesler was appointed by SNSF to set up a new special research field on "architecture and urban climate" within that framework, he leads a group of doctoral and postdoctoral researchers. Roesler currently works on a book project about the appropriation of the notion of "urban climate" from the perspective of modern architecture. It reconstructs the intellectual history of adapting urban climatology insights through twentieth century architecture, particularly those models aimed at controlling urban microclimates and the associated buildings by passive means. The project examines the transformation of the scientific object—the urban climate—into a design artifact, and thus the applicability of urban climatology in the field of architecture.

Beyond Tropicality:
Heat and Colonial Weather Science in the Straits Settlements C. 1820-1900

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Historical explorations of tropical heat in a colonial context have largely focussed on two interconnected spheres: colonial perceptions of place and body[1] or, the implications of heat on different bodies in medical thought and practice.[2] This paper seeks to move the discussion towards a history of colonial scientific thought about heat as component of weather and of escalating nature-induced hazards and studied in the observatory or meteorological department. A central premise is to think about heat in its relationship to nascent meso-scale atmospheric knowledge, meteorological theory and, as a by-product of urbanisation and land-use change. In so doing, it conceptualises the scientific understanding of heat as essentially responsive, embodied within science as result of how heat is prioritised in local contexts and in the understanding of human-induced climatic change. The paper works thus across the disciplinary boundaries of history of science and environmental history to highlight an underexplored aspect of the Straits Settlements' past.

Fiona Williamson is Assistant Professor of Science, Technology and Society at Singapore Management University and Fellow of the Asia Research Institute, National University of Singapore. She is an environmental historian working on intersections between climate and urban society in Singapore, Malaysia, Hong Kong, and British colonial meteorological science. Her current interests include the history of floods, droughts and the El-Nino Southern Oscillation (ENSO) in the Straits Settlements and the history of heat in Singapore and Hong Kong.

[1] For example, James Beattie, *Empire and Environmental Anxiety: Health, Science, Art and Conservation in South Asia and Australasia, 1800-1920* (Palgrave Macmillan, 2011); David Arnold, *The Tropics and the Traveling Gaze: India, Landscape and Science, 1800-1856* (Seattle and London: University of Washington Press, 2006); D. Kennedy, 'The perils of the midday sun: climatic anxieties in the colonial tropics', in J. M. MacKenzie ed. *Imperialism and the Natural World* (Manchester: Manchester University Press: 1990), 118–140.

[2] Hans Pols, 'Health and Disease in the Tropical Zone: Nineteenth-century British and Dutch Accounts of European Mortality in the Tropics', *Science, Technology & Society* 23:2 (2018): 324-329; David Arnold, 'Introduction', in David Arnold, Ed., *Warm Climates and Western Medicine: The Emergence of Tropical Medicine, 1500-1900*, 2nd edn. (Amsterdam-Atlanta, GA: Rodopi B. V, 2003), pp. 1-19; David Livingstone, 'Tropical Hermeneutics and the Climatic Imagination', *Geographische Zeitschrift* 90:2 (2002): 65-88; Warwick Anderson, *The Cultivation of Whiteness: Science, Health and Racial Destiny in Australia* (Australia: Melbourne University Press, 2002); Mark Harrison, *Climates and Constitutions: Health, Race, Environment and British Imperialism in India 1600-1850* (New Delhi: Oxford University Press, 1999).

Urban Heat Island in Transformation in Singapore

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Urban Heat Island (UHI) is defined as an urban area that experience warmer temperature than their surroundings (Oke, 1982, 1995) and has been known as one of the major features of anthropogenic climate modification. Studies from diverse contexts keep a strong record of major determinants of UHI in land cover (Liang and Weng, 2008; Zhang et al., 2016) and high levels of built density in cities (Chen et al., 2009). Some find large traffic volumes that discharge anthropogenic heat into urban areas and high levels of population density highly critical (Chen et al., 2009; Wong et al., 2016). While the relationship between the fast-growing urbanization and the UHI formation has been thoroughly investigated by researchers, there is little focus on planning's impacts on long-term changes in local temperatures and their spatial distribution as a result of implementing numerous plans over times.

This study will examine how Singapore's planning efforts established after the mid-20th Century have affected the thermal environment of the city in association with its UHI effects. Since this research will analyze the planning's role in shaping the thermal environment of the city, the time scope for this research will be relatively recent using the historical temperature data available from the Meteorological Service Singapore since the 1980s. The availability of observational data and the duration of records vary across stations. Out of 63 existing weather stations, 21 weather stations provide daily temperature data at different time ranges, mostly from 2009, some from the 1980s. The historical temperature maps will be made using them. Planning of Singapore has been regulating the growth of its downtown while promoting the growth of other parts of Singapore. Hence, its impacts have reflected on the urbanization patterns and the urban heat island in Singapore accordingly. This research will make a case for the role of planning in mitigating a city's urban heat island effect providing lessons for the other fast urbanizing cities across the world.

Yoonhee Jung is Postdoctoral Fellow in the Asia Research Institute at National University of Singapore. She received her PhD in the field of Geography and Urban Studies from the Temple University in December 2018. Her research focuses on urban challenges caused by climate change, urban politics around urban sustainability planning in Asian megacities, and the effectiveness of urban policies in promoting just sustainability. She has published her peer-reviewed journal articles in *Sustainability Cities and Society* and *Land Use Policy*. She is currently researching on planning factors shaping thermal environment in association with urban heat island effects in Singapore and Seoul.

Turning up the Heat: The Increasing Risk of Summer Fire in New Delhi

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Urban fire is a hidden problem in New Delhi as in other cities in India. It goes largely unseen and underreported despite the devastation it causes. Much of New Delhi comprises densely packed industrial, commercial and residential structures impossible to reach by four-wheel motorized transport, "authorized" colonies of narrow lanes and single entrance dwellings, or "unauthorized" colonies of mainly informally built structures, where people live cheek by jowl, and with only pedestrian access. According to official statistics, there were 318 deaths and 1,767 people injured by fire in 2017-2018 but these figures certainly underestimate the extent of the problem and the real figures are likely up to six times greater. There is anecdotal evidence, too, to suggest that large-scale fires in the outer suburbs burn down entire districts and are not recorded in official statistics. Urban fires also burn to their own particular rhythms related to climatic conditions that correspond to the main seasons of the year: winter, summer, and the monsoons. The intense summer heat means that even a small spark from a faulty electrical connection or an overloaded AC unit can ignite a fire in minutes, especially as windows and doors stand open to catch any breeze and so facilitates the more rapid spread of flames. The constant electricity "brownouts" also force residents to use candles for illumination posing yet another major source of fire in structures made from easily inflammable materials such as wood, plastic or cloth. This paper examines the relationship between the incidence of urban fire in residential areas of New Delhi in relation to rising seasonal temperatures as a result of climate change.

Greg Bankoff works on community resilience and the way societies adapt to hazard as a frequent life experience. For the last 25 years, he has focused his research primarily on Asia seeking to understand how societies, both past and present, have learnt to normalize risk and the manner in which communities deal with crisis through a historical sociological approach that combines archival analysis with fieldwork, community mapping, interviews and focus groups. An historical geographer, he is Professor of Modern History based at the University of Hull and has published extensively including over 110 referred journal articles and book chapters. His most recent publications include co-authoring *Cultures and Disasters: Understanding Cultural Framings in Disaster Risk Reduction* (2015) and a co-edited volume entitled *Natural Hazards and Peoples in the Indian Ocean World: Bordering on Danger* (2016).

The Birth of Cool:
A Cultural and Technological History of Heat in Wuhan, 1950-2019

Chris COURTNEY
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Wuhan is infamous as one of China's furnace cities, experiencing high temperatures and humidity throughout the summer. Based on oral history interviews, archival and library research, this paper reconstructs how ordinary citizens coped with this extreme heat between the 1950s and 1990s. At the beginning of this period, most people spent the summer sleeping outside in communal spaces on bamboo beds. This practice is remembered today with considerable nostalgia, as it seems to exemplify the collectivist ethos of a period in which whole neighborhoods ate, worked, and socialised together. The reality was somewhat more complicated, as issues such as gender and political status influenced one's capacity to feel comfortable in communal spaces. The practice of outdoor sleeping began to decline in the 1980s, with its final death knell sounding following the introduction of air-conditioning in the 1990s. The capacity to create artificial interior thermal comfort has both reflected and precipitated a broader transformation of urban life, notably the increased privatisation of space and a collective retreat behind closed doors. These processes have resulted in greater private comfort at the cost of increased collective discomfort. The capacity to use public space has declined precipitously, whilst air-conditioning has exacerbated the urban heat island effect, pushing Wuhan temperatures ever higher. In this respect, the recent history of one city serves as a microcosm for regional and even global processes of environmental change.

Chris Courtney is a social and environmental historian of China, specialising on the history of Wuhan and its hinterland. His previous research focused upon the history of nature-induced disasters in the 19th and 20th centuries. His monograph *The Nature of Disaster in China* examined the history of the 1931 Central China Flood, and was awarded the 2019 John K Fairbanks Prize. Chris has also published on topics including the history of environmental religion, fire disasters, and Maoist flood (mis)management. His current research focusses on the problem of heat in modern Chinese cities. Using a combination of archival and oral history he is examining how people coped with extreme temperatures through a period of rapid cultural, political and technological change. He explores how emergent technologies such as ice factories, electric fans, and air conditioning transformed the cultural and social landscape of urban China.

The Urban Ecology of Ice

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In the last 20 years, more reliable power supply in metropolitan India has led to the proliferation of domestic and commercial electrical refrigeration technologies. This expansion has been supported by policies of economic liberalization since the 1990s, which have made fridges and freezers affordable for a burgeoning lower-middle class. However, alongside cooling appliances powered by electricity, urban India still continues to rely on buying ice. From the morgue to the market, slabs of ice cool corpses, bottled beverages and fish. Juice from freshly crushed sugarcane flows over cubes of ice; crushed ice balled up a stick and drenched with flavored syrup is a child's delight. Across the urban spectrum, but most so for the working classes, buying ice is still an important technique for beating the heat.

My paper will trace the ecosystem around the Prag Ice Factory in north Delhi, from production to consumption. Through close observation and interviews, I shall examine how the ice factory and its customers have changed over the last 50 years. I shall look at the retail trade in ice at a market in north Delhi to study the multiple uses of ice. My aim is to understand how this low-cost, low-energy technology, with a smaller ecological footprint, continues to occupy a niche that is being squeezed by electrical refrigeration. In particular, I am interested in the role of ice in enabling mobile street vendors to sell food and beverages: a defining feature of urban public space. My paper contributes to the theme of 'Living with Heat'.

Amita Baviskar is Professor of Environmental Studies and Sociology-Anthropology at Ashoka University, India. Her research focuses on the cultural politics of environment and development in rural and urban India. Her publications include the monographs *In the Belly of the River: Tribal Conflicts over Development in the Narmada Valley* (OUP, 1995) and *Uncivil City: Ecology, Equity and the Commons in Delhi* (Yoda Press and SAGE, 2020). Her recent edited volumes include *Elite and Everyman: The Cultural Politics of the Indian Middle Classes*, with Raka Ray (Routledge, 2011) and *First Garden of the Republic: Nature on the President's Estate* (GoI, 2016).

Living *with* Heat: Exploring the Concept of Heat in Ayurveda, Biomedicine, and Tropical Medicine

Ashawari CHAUDHURI
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The expression of agni (fire) or tejas in Ayurveda is through pitta. The root from which the word pitta is derived is tap, which means three things – heat, burning of food, and the control of the psychic factors. The relation between fire, heat, and pitta is deeply intertwined and sometimes the words fire and pitta are even used interchangeably. Fundamental to these concepts around heat, as is the case with most of Ayurveda, is the inevitable, invincible relation between the environment and the body. The five elements – air, water, fire, earth, and space – are the constitutive elements of the body as well. Fire and heat signify change of some kind like digestion of food, for instance. The paper asks two questions: first, if the body is the microcosm of the environment, and if the concept of balance is at the heart of Ayurveda, then how can one reimagine the body within the context of increasing heat in the environment? And, second, there are multiple forms of fire and pitta in Ayurveda. Heat or what it does is neither a singular concept nor can it be measured by the sole recognition of the increase of body temperature. Can this multiple conceptualization of heat be valuable in biomedicine or in public health that follow a linear way of correlating increasing temperature and heat?

Ashawari Chaudhuri is interested in how knowledge about things is formed through the practices of different communities, and whether there are ways to bridge or weave together forms of knowledge that emerge from different or even opposite contexts. She completed her PhD in Anthropology and Science, Technology and Society (STS) at Massachusetts Institute of Technology in 2019, and is now a Post-Doctoral Fellow at the Asia Research Institute, National University of Singapore. Her dissertation research was on agricultural biotechnology in India, and explains how communities on opposite ends of the agrarian political economy, like farmers, biotechnologists, and agricultural breeders, understand and work with genetically modified seeds. She asks what is at stake when techno-scientific objects and biotechnology as a form of knowledge determine the future of agriculture in a country. This led her to explore temporalities or experiences of time, thinking of seeds as commodities, history and anthropology of science in India, and connections between agriculture and environment in South Asia.

Gateway to Cold:
Drinks and Desserts in Colonial Singapore

Nicole Tarulevicz
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A cold Tiger Beer, a plate of fruit nestled in ice, a bowl of ice kacang, a Milo dinosaur; cold drinks and desserts are ubiquitous contemporary remedies to Singapore's heat. Yet residents of colonial Singapore were initially unconvinced of the value of cold. The Whampoa icehouse shipped ice from the USA it opened in 1854, but closed two years later, with demand half of expectations. Popularising cold was a slow journey, cold drinks and desserts were the gateway commodities. Whilst these commodities are not currently considered healthy foods, in the colonial era they were routinely advertised as such. "Ah the doctor was right when he prescribed Tiger Beer," reads one advertisement, while another encouraged readers to ask their doctor "for Milo Tonic Food." Tropical heat was understood to pose a particular threat to colonial bodies, gustatory coldness could therefore provide health benefits. Pairing foods that were understood as good for health because they were enriched with vitamins, had high calorific value and nourishment, made sense, but consumers still had to be persuaded through advertising. Steamboats with ice-stores boasted about the freshness of food on their journey, hotels offered cold aerated water, ice cream saloons advertised their upcoming flavors, blending ideas about health and cold in a moment in which technology was profoundly changing what was eaten and how it tasted. In this paper I consider the ways in which the cultural properties of food sit alongside the nutritional ones, shaping ideas about what was safe, healthy, and necessary.

Nicole Tarulevicz (Nicki) is Associate Professor of History, and the incoming Head of History and Classics in the School of Humanities at the University of Tasmania. She is the author of *Eating Her Curries and Kway: A Cultural History of Food in Singapore* (University of Illinois Press, 2013) and is the recipient of an Australian Research Council Discovery Grant, "Search for Safety: A Cultural History Lesson on Food Safety from Singapore," (funded 2019-22). She is currently working on a book emanating from the grant. Her most recent publications include articles in *Food, Culture, and* Society and *Global Food History*.

Engineering the Urban Climate: The Thermal Modulation of Outdoors?

Simon MARVIN
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Under conditions of accelerating climate change and continued urbanisation, sustaining everyday urban life in many parts of the world will increasingly depend on the capacity to live with heat extremes. Measures such as urban greening and passive design solutions might offer half of the thermal amelioration required. There will therefore be a need to invest in active, controllable, and targeted outdoor cooling systems – water misting, high-capacity fans, and district cooling – if heat-stressed cities are to function effectively. The capacity to control heat is becoming a strategic imperative for urban authorities, so that outdoor urban space can be maintained as a safe, reliable and liveable environment for humans, nature and essential infrastructure. A growing outdoor cooling sector is now offering solutions as advances in microclimatic expertise, digital weather monitoring, and novel cooling systems reflect the growing importance of urban thermal management. These socio-technical systems reflect a new logic of 'engineering' the urban climate, to produce technically mediated 'perfect weather' all-year-round. Yet thermal comfort in outdoor settings has received very little critical attention, partly because the application is novel, but also because control of many outdoor spaces is not so clearly defined as the indoors. Using examples from the Asian region the paper examines why and where urban outdoor cooling is emerging and who is driving its development, how technologies are being used to engineer outdoor thermal comfort and what are the wider societal implications of outdoor cooling for the rhythms of urban life it facilitates (or impedes)?

Simon Marvin is Director of the Urban Institute at the University of Sheffield and holds a fractional appointment in the School of Architecture, Design and Planning at the University of Sydney. Simon is interested in the interrelationships between technological change and the urban condition and has made key contributions in urban studies focused on the analysis of infrastructural liberalisation, low carbon transitions, digital technologies, living labs, urban operating systems and AI and robotics. Recently his work has focused on the role of the socio-technical systems in the production of micro-climatically controlled volumetric environments including both indoor enclosures and outdoor thermally controlled spaces. The paper in this conference draws on some of his more recent work conducted at the University of Sydney tracing the development of an outdoor cooling sector in Asia and its implications for urban studies.

Thermal Governance, Circuits of Hydrocarbons, and the Architecture of Carbonized Comfort

Jiat-Hwee CHANG
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How did we arrive at the current dependency on energy-intensive air-conditioning to cope with heat in urban Asia? There were many socio-envirotechnical pathways that led to this dependency. This paper seeks to explore the history of one of these pathways that led to petro-urbanism and air-conditioned thermal culture in the Arabian Gulf cities.

As urban change in the Gulf cities is "the most tangible outcome of oil wealth," the recent urbanization in these cities has often been characterized as petro-urbanism. Likewise, as the distribution of oil rent is central to understanding politics in the Arabian Gulf, the states in that region are seen as oil states. Although these theories of petro-urbanism and oil state have been challenged recently, there is no doubt about the quantitative and qualitative differences heavily-subsidized and widely-available oil and energy in the Gulf cities made to their urbanism, politics, and societies.

I seek to understand this nexus of oil, urbanism, and cooling technology by exploring how oil was mediated through space. More specifically, given that natural gas is the other major fossil fuel resource in the Gulf, it is "to follow the carbon" (cf. Timothy Mitchell in *Carbon Democracy*) through space in order to understand how it circulates and converts from one form of resource and power (in both the energetic and interpersonal senses of the word) to other forms spatially, materially, environmentally, and—given my interest in air-conditioning—atmospherically. Focusing primarily on post-1950s Doha, I plan to follow the carbon while incorporating interdisciplinary theories of petrodollars recycling and urban metabolism to understand its built environmental and atmospheric transformations. I argue that these transformations have to be understood in connection to the circulations and translations of hydrocarbons into petrodollars, energopower (a combination of energetic and biopolitical power), and carbon-intensive forms of architecture and urbanism that were dependent on air-conditioning.

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Urban Energy Landscape in Practice: Architecture, Infrastructure and the Material Culture of Cooling in Post-Reform Chongqing (PR China)

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Until the 1990s and the spread of air-conditioning, cooling down during the hot, humid, and windless summers in the city of Chongqing (Southwest China) was mainly practiced outdoors: sleeping on the rooftops of multistorey buildings, playing Mahjong in the streets, fanning oneself with a hand fan or installing bamboo beds in the compounds' greened courtyards. With the availability of affordable electricity and the popularization of mechanical cooling, refreshing oneself has been relocated to the indoors. This paper traces the history of heat mitigation in Chongqing since the 1950s. Based on five months of anthropological fieldwork, semi-structured interviews, and written and oral history, I analyze how Chongqing residents cope with heat in and around the built environment. Practices of cooling are closely intertwined with the architectural history of the city, e.g. building design, construction materials, green spaces, or the arrangement of houses. Staying cool has meant something else when dwelling in the socialist buildings from the 1960s compared to the highrise buildings in the early 21st century. Theoretically, the paper engages with urban energy landscapes as "connective tissue" (Castán Broto 2019) where everyday heat-mitigating practices are intertwined with the locally built environment including architecture, energy infrastructures and technologies. By focusing on the material culture involved in cooling, I deviate our perspective from the large infrastructure to the small objects that co-constitute the energy landscape.

Madlen Kobi is a social anthropologist working at the Academy of Architecture of the Università della Svizzera Italiana, Switzerland. As part of the project "The City as Indoors: Architecture and Urban Climates" (http://www.roesler.arc.usi.ch), funded by the Swiss National Science Foundation, she is currently investigating the relations between architecture, socio-technical knowledge, and everyday climate-related practices in residential spaces in Chongqing, China. Madlen Kobi is the single author of *Constructing, Creating and Contesting Cityscapes: A Socio-Anthropological Approach to Urban Transformation in Southern Xinjiang, P.R. China* (Harrassowitz, 2016) and co-editor of *The Open Cut – Mining, Transnational Corporations, and Local Populations* (LIT, 2016), *The Urban Microclimate as Artifact: Towards an Architectural Theory of Thermal Diversity* (Birkhäuser, 2018) and *Architecture and/as Infrastructure* (Roadsides, 2020). Her articles have been published among others in *The International Journal of Urban and Regional Research*, *Social Anthropology*, *TSANTSA, Inner Asia, Eurasian Geography and Economics, Architecture Beyond Europe* and *Central Asian Survey*.

Constructing Modern Freshness: Refrigeration and Food Consumption in 1930s Shanghai

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An extraterritorial entity of three municipal units separately administered by Chinese and foreigners, 1930s Shanghai provided a crucial site for transnational encounters, of which the refrigeration based on imported technology and industrial capitalism was an integral part. As the governmental authorities deployed urban infrastructure to safeguard the quality of the domestic environment, the emergence of global techno-culture and its localization reframed people's perception of everyday life.

The equipment of the cold storage, for instance, facilitated the official agencies centralization of food supply and intervention in public health, thus managing the social changes associated with modernization. In the French Concession and the International Settlement under the jurisdiction of the British-dominated Council, municipal retail markets and abattoirs institutionalized food provision under sanitary ordinances. Supervised by the Ministry of Industry of Republican China, the Shanghai Fish Market project spent one-third of its budget on building the country's largest cooling plant, which served the Kuomintang's goal of recovering sovereignty over its economy from foreign dominance and private capital. When the transfer of knowledge regarding modern household made Western-introduced novelties, such as the electric refrigerator, fashionable, the Chinese-made icebox became a well-received half-priced substitute.

In Shanghai, a treaty port city known for its hot and humid summers, in the 1930s, refrigeration not only offered technical means of achieving freshness but a social instrument for urban governance entangled with local power struggles. It captivated the urban audience as a sign of imminent modernity and the mastery of nature.

Zhengfeng Wang is an advanced PhD candidate in Art History at University College Dublin and a residential scholar at UCD Humanities Institute. Her dissertation is tentatively titled "Institutionalizing Modern Consumption: Market Buildings and Department Stores in Chinese Cities, 1930s-1950s." Based on archival work involving the architectural projects in interwar Shanghai, British colonial Hong Kong, and socialist Beijing, her research explores how the commercial building types that facilitated urban prosperity in the capitalist West modernized Chinese everyday life from the Republican Era to the Communist regime. Wang has presented papers at international conferences and published research and translations on architectural modernity. Her article "The Central Market in Hong Kong: Urban Amenities in a Speculative Field" in the volume *Mobs, Microbes, Glass and Metal: Markets as Arbiters of Civic Order and Public Health* edited by Dr Leila Marie Farah and Dr Samantha L. Martin-McAuliffe will be published by Leuven University Press in fall 2021.

The Political Ecology of Bangkok's Unequal and Unjust Urban Heat Island

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The intensity of Bangkok's urban heat island (UHI) during the dry season can be as high as 6-7°C and in the densest areas the UHI's intensity is approximately 4°C. The UHI thus is causing a city already oppressively hot to become even hotter. The UHI also contributes to health problems, such as heat stroke and fatigue, particularly when heat waves arise, such as in 2016 and 2019. Our paper will historically examine the numerous causes of Bangkok's UHI, such as lack of green space, high levels of air conditioning, and high rates of vehicle exhaust fumes. For example, Bangkok has only three square meters of green space per person which is one of the lowest in all of Asia. The paper will then analyse the drivers of these causes from a political economy framework, including uneven power relations, fragmented and weak governance, and the role of vested interests. It will also look at which groups contribute the most to this problem and which groups suffer the most from UHI. It will then argue that Bangkok's UHI is a strong example of environmental injustice not only in terms of distribution but also in terms of recognition and procedure. Our paper will be the first to use a political ecology framework to examine this problem. To obtain data for the article, we will conduct interviews with a number of key actors in agencies, including urban planning, transport, and energy, whose practices significantly affect Bangkok's UHI.

Danny Marks is Assistant Professor of Environmental Politics and Policy at Dublin City University. Prior to this position, he was Assistant Professor of Environmental Studies at City University of Hong Kong. He also was Postdoctoral Research Fellow at the Munk School of Global Affairs of the University of Toronto. Dr Marks has spent a number of years conducting research and working in Southeast Asia, particularly in the field of environmental governance. He completed his PhD dissertation, "An Urban Political Ecology of the 2011 Bangkok Floods", at the University of Sydney. He received his MA in International Affairs from the Johns Hopkins School of Advanced International Studies. His research interests are political ecology, environmental justice, climate governance, disaster risk reduction, with a focus on Southeast Asia, particularly Thailand. His research has been published in a number of leading peer-reviewed journals, including *Political Geography, Habitat International,* and *Sustainable Cities and Society*.

Kittima Leeruttanawisut is working as Local Strategic Advisor at the UN-Habitat in Bangkok. She is also a deputy director of AIM (Assistance in Implementation and Management Housing, Heritage and Climate Change for Urban Development), a consulting firm which gives consulting services, training and research on Housing, Heritage and Climate Change for Urban Development and a research fellow at Land Governance Laboratory in USA. She obtained her Doctoral degree from the Faculty of Urban Science at Meijo University in Japan. She received her two master's degrees from Chulalongkorn University in Regional Planning and from the Institute for Housing and Urban Development Studies (IHS) in Rotterdam, the Netherlands in Urban Management. Her dissertation focused on the second generation of the urban poor in Thailand. Her research interests are urban planning, environmental management, climate change adaptation, heritage management, and strategic land planning.

Technocracy and Soldier Centrism: A History of Heat Stress Management in the Singapore Military

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The history of heat strain management in the Singapore Armed Forces (SAF) has been largely written from medical perspectives which typically describe the efficacy of the SAF's medical interventions and its concomitant heat injury incidence patterns. We seek to move beyond these medical narratives and re-situate the SAF's history of heat strain management within the national context. We will examine the state's efforts to shape public discourses about the successes of its management. Two discourses can be discerned. The first, which emerged during the late 1980s, was the use of a technocratic approach to showcase the military's capability in addressing its high incidence of heat injuries. This was demonstrated through the introduction of SAF-wide training measures, and the construction of local scientific research expertise, which led to a sharp reduction in heat injury incidences from the 1980s to 2010s. Through this, the SAF argued that its heat strain mitigation measures were comparable to the world's best militaries. Secondly, the state shaped a soldier-centric discourse in the late 2000s on the back of an increasing emphasis on safety and the transformation of the SAF into a highly-educated and technologically-sophisticated force. This meant a shift towards concern about the welfare of every soldier, particularly through the state's drive to eradicate all training-related deaths. Accordingly, new measures were implemented in hope to eradicate any death due to heat strain. In all, the soldier-centric discourse has been increasingly utilised to persuade the public that the risks of heat can be comprehensively mitigated.

Joshua Dao Wei Sim (PhD, National University of Singapore) is a historian of Christianity and modern China who recently completed his dissertation on a history of transnational Chinese evangelicalism. He is currently Doctorate Trainee in the NUS Department of History. Joshua is also trained in the sports sciences and worked in the SAF as Exercise Scientist from 2011 to 2013. He retains a strong interest in the discipline from a historical perspective.

Jason Kai Wei Lee (PhD, FACSM) completed his doctoral degree in Exercise Physiology at Loughborough University UK. He studies the physiological demands associated with passive and exertional heat stress and how humans adapt to ensure optimal performance and survival. He is currently Research Associate Professor in Yong Loo Lin School of Medicine at the National University of Singapore and the Research Programme Lead on Heat Health and Work Productivity at the Global Asia Institute in National University of Singapore.

‘A Hill Station for Whom?’: Hill Stations and the Racialized Politics of Coping with Heat in Colonial Malaya and the Philippines, 1920s-1930s

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The hill station was a concept made famous in nineteenth century British India as a means to escape the summer heat of lowland cities. In India and Southeast Asia, white colonists were advised to seek regular convalescence at hill stations for physical and psychological respite from the perceived negative effects of tropical heat. Yet, colonists were not the only group who sought out the supposed therapeutic benefits of hill stations. This paper takes an innovative approach to the history of hill stations by focusing on Chinese elites who sought out ‘healthful holidays’ at the hill stations of Malaya and the Philippines.

By comparing Baguio in the Philippines with Fraser’s Hill and the Cameron Highlands in Malaya, it illustrates the particular racialized and class-based politics of health in these sites. While Baguio was primarily the domain of Americans, by the 1920s it was promoted as a place where ‘all nationalities’ were welcome. However, American officials were more concerned with making Baguio available for Filipino elites as opposed to Manila’s Chinese merchant class. In contrast to the inclusive rhetoric of the American Philippines, official and unofficial color bars ensured that Malayan hill stations were reserved for British colonists. This was controversial, with Chinese elites in Singapore and Kuala Lumpur condemning the amount of the public money spent on developing hill stations that benefitted a small minority. Debates around hill stations provide unique insights into how social privilege and inequity shaped the capacity of people in the past to cope with tropical heat.

Claire Lowrie is Senior Lecturer in History at the University of Wollongong, Australia. Her research focuses on the history of Chinese migrants and colonialism in tropical northern Australia and Southeast Asia. She currently holds two Australian Research Council Discovery Project – one on the history of Chinese Indentured Labour across the Asia-Pacific and another on the history of Indian *ayahs* and Chinese *amahs* in Southeast Asia and Australia. Claire has published her work in *Modern Asian Studies*, *Pacific Historical Review*, *Journal of Colonialism and Colonial History* and *Gender and History*. Her latest book on *Colonialism and Male Domestic Service across the Asia-Pacific* (co-authored with Julia Martinez, Frances Steel and Victoria Haskins) was published by Bloomsbury in 2019.

Heat in a Time of Corona: An Analysis of the Nexus of Thermal Practices and Virus Transmission Management in Three Cities

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In regions of the world that experience extreme heat regularly, everyday practices explicitly and implicitly help people manage heat through shaping exposure, exertion, cooling and hydration. The advent of the Covid-19 pandemic and attempts to control it radically disrupted everyday practices. These changes coincided with the onset of the hot season in South and Southeast Asia, or played out in the context of chronic exposure in more equatorial regions. As such, there is a need to understand how changes to everyday practices changed exposures to heat as well as to covid, to ensure that the prevention of one health risk isn't inadvertently creating another. This paper explores how low-income residents across 3 cities - Karachi, Pakistan; Hyderabad, India; Jakarta, Indonesia - typically cope with the challenges of urban heat, and whether these changed as a result of coronavirus measures. The paper draws on the results of a mobile phone survey conducted in 2020 with over 3,000 respondents. We analyse these results using a practice theoretical approach that helps us draw out cultural, material, technological and embodied capacities, affordances and limitations available to residents as they went about their daily lives. Two practices that appeared as significant from the survey were: using outdoor/green space to cool down, and bathing or showering to cool down. Broad patterns in how exactly these practices were performed, the extent to which they were used and whether they changed during the pandemic varied from city to city. Given the data was collected remotely as a necessity of the pandemic, and had limited qualitative content, the paper uses the survey results to surface issues for qualitative empirical studies over the next two years. We close by reflecting on the methodological value and limitations of the survey approach for developing practice theoretical – and more broadly cultural materialist – means of understanding life with heat in urban Asia.

Elspeth Oppermann is Senior Research Fellow at the *Rachel Carson Centre for Environment and Society, Ludwig Maximilians University, in Germany. A* critical geographer specializing in adaptation to environmental challenges, she is a CI on the *Cool Infrastructures project (along with her co-authors on this paper)*, which examines how 'off-grid' communities manage heat. Elspeth is also an investigator on a 3-year project led by the National University of Singapore, entitled 'Surviving and Thriving in a Heat-Safe Singapore'. The 'Heat-Safe' project looks at health and wellbeing impacts of chronic heat exposure for laborers and their families in Singapore, Vietnam and Cambodia. A multi-disciplinary project, it will identify novel cross-domain interventions to help workers not just survive but thrive in a warming world. Elspeth is also a member of the International Commission on Occupational Health's Scientific Committee on Thermal Factors, and a member of the Global Heat Health Information Network.

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Nausheen Anwar is Director of the Karachi Urban Lab. She received her PhD in City and Regional Planning from Columbia University, USA. Nausheen's work focuses on the politics of urban planning and infrastructural development. She has authored a book: *Infrastructure Redux: Crisis, Progress in Industrial Pakistan and Beyond* (2015, Palgrave Macmillan), which explores, through detailed cases of Sialkot and Faisalabad in industrializing Punjab, the double-edged narratives of development that frame infrastructure in post-independence Pakistan. Nausheen is the recipient of several grants from DFID, IDRC, AHRC-ESRC, UKRI/GCRF, National University Singapore and Harvard University. Nausheen's work has appeared in the journals *Antipode*, *Urban Studies, EPW*, *Singapore Journal of Tropical Geography*, *South Asian History and Culture*, and *Environment & Planning A*.

Heat, Cold, and Climatic Determinism in Chinese Medicine

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In the clinical practice of modern (Western) medicine, heat figures mainly as a sign of danger. The escalation of body temperature indicates fever in the case of an infection, or warns of heat-stroke from environmental stresses. Chinese and other Asian medicines, while familiar with both of these conditions, have a different and more complicated clinical and theoretical relationship with heat. In Chinese medicine (CM), heat is an element not necessarily recordable as temperature, and which can effect personal health through mere imbalance. It is also bound up with larger patterns of ill-health, as well as diagnoses and curative treatments, through the medium of climate. The points of difference between the two medicines are not incidental to public health concerns over rising global temperatures, given that medical systems in most Asian countries remain plural in the early 21st century. Indeed, CM, as well as Ayurveda, Sowa Rigpa, and other health systems sometimes called "complementary" have evolved into what Stefan Kloos calls "Asian medical industries": powerful assemblages of pharmaceutical firms, clinics, colleges and universities, journals and online platforms, NGOs, and high-level state actors.[3] Their conceptions of heat and health (and those of the populations they serve) have figured prominently in Asian responses to contemporary zoonotic epidemics, and will almost certainly factor into how Asian populations conceive of, and treat, the unfolding crisis of rising temperatures.

Liz P.Y. Chee is Research Fellow at the Asia Research Institute (ARI) and Fellow and Lecturer at Tembusu College, both at the National University of Singapore. She was the first graduate of the Edinburgh University – NUS Joint PhD Program, specializing in the history and anthropology of medicine. Her research and teaching interests span Chinese medicine, animal studies, and food studies. Liz' book *Mao's Bestiary: Medicinal Animals and Modern China* (Duke University Press, 2021) is the first scholarly history of the use and abuse of animals in Chinese medicine and pharmaceuticals. Moving forward, she aims to broaden her research in Chinese medicine to include its role in China's Belt and Road Initiative. Liz is also currently working on a history of kitchens in Singapore, among other projects.

Dongxin Zou is a historian of modern China, with a focus on medicine and public health. She is particularly interested in how Maoist ideologies and politics shaped medical practices and public health initiatives as well as how issues in medicine and health care became central to postcolonial geopolitics. She is currently working on a book manuscript, which draws on archival documents, memoirs, oral interviews, and clinical observation to document the rise of a globalizing China in the postcolonial world through the medical and humanitarian networks between Chinese provincial health institutions and Algerian medical facilities. Dongxin received her Ph.D. in History from Columbia University in October 2019. She is now Postdoctoral Fellow in Science, Technology, and Society (STS) Cluster at the Asia Research Institute, National University of Singapore.

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[3] Stefan Kloos, *Asian Medical Industries: Contemporary Perspectives on Traditional Pharmaceuticals* (London: Routledge, forthcoming).

modern Japan and East Asia. His book *Earthquake Nation: The Cultural Politics of Japanese Seismicity* (Berkeley: U. of California Press, 2006) won the Sidney Edelstein Prize from the Society for the History of Technology in 2007; and was selected as one of the "11 Best Books about Science" for the UC Berkeley Summer Reading List in 2009.

Accounting for the Urban in Heat Action Planning and Fast Policy

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This paper lays the ground for a temporal and spatial analysis of heat action planning in South Asia and beyond. As we emphasise, drawing on approaches to disaster in science and technology studies, making heat *disastrous* has had significant implications; both for the urgency with which governments and policy makers prepare for it and the effects they seek to achieve. Drawing on a history of India's first urban heat action plan, designed for the city of Ahmedabad in the state of Gujarat, this paper shows how the prevention of disastrous heat has accelerated the emergence of 'heat action plans' as a tool for urban planning. As we show, the rapid roll out of heat action plans as a template for organising and managing public health interventions in Indian cities, has required a particular kind of scalar work and a particularly narrow accounting for urban specificity.

Aalok Khandekar is Assistant Professor of Anthropology/Sociology in the Department of Liberal Arts and the Department of Climate Change at Indian Institute of Technology Hyderabad. Aalok's research focuses on understanding and developing collaborative infrastructures—the (often collaboratively built) socio-technical systems undergirding contemporary lifeworlds that allow a variety of differently situated social actors to come together to address complex issues. Aalok directs STS Infrastructures, a platform supporting a wide-range of initiatives to constitute and bring together a global community of researchers in the field of Science and Technology Studies (STS), including the Transnational STS Working Group. He is also the incoming editor-in-chief of *Engaging Science, Technology, and Society*, the Open Access journal of the Society for Social Studies of Science.

Jamie Cross is Professor of Social and Economic Anthropology at University of Edinburgh and Principal Investigator for the Cool Infrastructures project. Over the past decade Jamie's work has examined how fuel and electricity organises or re-organises life in places of chronic global poverty, with a particular focus on the off-grid energy markets across the global south. He is the author of *Dream Zones: Anticipating Capitalism and Development in India* and his recent writing has been published in *Limn*, *South Atlantic Quarterly*, *Journal of the Royal Anthropological Institute*. He is also the co-designer of *Solar What?!* an award-winning open source, solar powered lamp built to challenge the social and material politics of technology in the off grid solar industry.

Anant Maringanti is a geographer with a PhD from University of Minnesota and has taught graduate courses at the National University of Singapore and University of Hyderabad. His research and teaching interests center on questions of urbanization and globalization from the South Asian vantage point. He is currently the Director of the Hyderabad Urban Lab, a multi-disciplinary research program run by the Right to the City Foundation. He has published widely in national and international academic journals on social movements, politics of development and urbanization.

Negotiating Shade in Changing Urban Climates in South Asia

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This paper opens up the social study of heat by exploring how people negotiate access to shade in South Asian cities. Although the climate has admittedly always been hot and humid in cities like Karachi, increasingly 'hotter' temperatures are exacerbating the impact of heat on urban dwellers. We trace the colonial and post-colonial changes to the natural and built environment that have changed the way urban dwellers experience heat, and how they navigate the city in search of shade. In particular, we focus attention on the practices of street hawkers, daily wage masons, construction workers, and others engaged in forms of precarious or informal labour. Working outdoors in the heat, they navigate their place in the city either around existing forms of shade or by creating and negotiating their own. As we argue, few people working on the streets of the South Asian city experience shade as an inalienable right. Rather shade is something that must be claimed alongside other rights and entitlements. As we explore, people's struggles to find and claim shade are constrained by visions of what a 'world class city' should look like. These frequently translate as large-scale infrastructural/ urban development projects that constrain nature to enclaves whilst replacing roadside trees and green spaces with a predominantly concrete and asphalt landscape. Closer attention to the ways that people negotiate shade opens up for analysis a wider spectrum of claims-making activity in changing South Asian urban climates**.** What then, will the cities of our future look like?

Soha Macktoom is Senior Research Associate at the Karachi Urban Lab. She is an architect, currently pursuing her postgraduate degree in urban and regional planning. She has been engaged over the last two years in a research project exploring the implications of development/infrastructural projects on the built environment and marginalized populations. As an architect, her key focus is on understanding the implications of human interventions on the natural and built environment, and how they affect the experience of the city for those living in it. She—along with the co-authors—is currently part of a three-year project titled 'Cool Infrastructures: Life with heat in the off-grid city' which looks at understanding the social and technical infrastructures for cooling in contexts of urban poverty across South Asia, Southeast Asia and Sub Saharan Africa.

Nausheen Anwar is Director of the Karachi Urban Lab. She received her PhD in City and Regional Planning from Columbia University, USA. Nausheen's work focuses on the politics of urban planning and infrastructural development. She has authored a book: *Infrastructure Redux: Crisis, Progress in Industrial Pakistan & Beyond* (2015, Palgrave Macmillan), which explores, through detailed cases of Sialkot and Faisalabad in industrializing Punjab, the double-edged narratives of development that frame infrastructure in post-independence Pakistan. Nausheen is the recipient of several grants from DFID, IDRC, AHRC-ESRC, UKRI/GCRF, National University Singapore and Harvard University. Nausheen's work has appeared in the journals *Antipode*, *Urban Studies, EPW*, *Singapore Journal of Tropical Geography*, *South Asian History and Culture*, and *Environment & Planning A*.

Jamie Cross is Principal Investigator for the Cool Infrastructures project. Over the past decade Jamie's work has examined how fuel and electricity organizes or re-organizes life in places of chronic global poverty, with a particular focus on the off-grid energy markets across the global south. He is the author of *Dream Zones: Anticipating Capitalism and Development in India* and his recent writing has been published in *Limn*, *South Atlantic Quarterly*, *Journal of the Royal Anthropological Institute*. He is also the co-designer of *Solar What?!* an award-winning open source, solar powered lamp built to challenge the social and material politics of technology in the off grid solar industry.

Mapping Vulnerable Groups in Urban Areas to Extreme Heat: Case Study in Ho Chi Minh City, Vietnam

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Mapping the vulnerable groups to extreme heat in urban areas is the focus of this research. Recent years, urban heat has become a wide-spread phenomenon and a major concern in Ho Chi Minh City that has been accompanying the city's rapid growth. This paper firstly presents a review of heat history in Ho Chi Minh City in the period of 30 years recently with the hypothesis that the heat has been increasing due to the urbanization and climate change. Secondly, the paper focuses on measuring the impacts of heat to the life and the way to earn living of urban residents, focusing on the vulnerable groups who are easily exposed to the heat. Thirdly, the paper will explore the adaptive capacity of exposed groups to the heat based on the hypothesis that man has better adaptive capacity than women in coping heat, the outside work group is more difficult in adapting to heat compared to the inside work groups. Furthermore, the paper predicts traditional work maybe lost in the future and the trend adapting to the heat.

The research collects data from survey with the semi-structured questionnaire in Ho Chi Minh City. The symmetrical comparison method is used to find the difference among outside and inside door groups in coping the heat. There are 120 semi-structured questionnaires of the pair of symmetry groups: street vendor - small store vendor, construction worker (outside) and workers in the house; the gender is integrated in measuring and comparing the difference among men and women in the adaptation to the heat.

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‘India is Nice and Hot and Sunny’: The Materiality of the Weather-World and Indian Diasporic Families’ Lived Experiences of Heat in Urban India

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Weather phenomena have historically been cast outside the realm of social theory, turning the latter into an exclusively human-centric project. This is further compounded by existing conceptual divides between earth/sky, surface/medium, wherein the landscape is taken as the limit of materiality thus rendering immaterial the medium through which humans and other sentient beings move in action and perception. Challenging these frameworks, this paper puts to work Ingold’s (2011) conceptualisation of the ‘weather-world’ to theorise the way Indian diasporic families engage with the materiality of heat during their yearly extended stay in their cities of origin in India. Here I conceptualise urban heat as a phenomenon of the medium that is constitutive of local weather-worlds. Drawing on interview narratives of Greater London-based middle-class Indian diasporic parents and their children, I show how lived experiences of heat in Indian cities mediate diasporic subjectivities. Indian diasporic children’s narratives reveal that their bodily experiences of urban heat in India are generative of diasporic memories and place-based identities. At the same time, the hot weather engenders risk anxieties in diasporic parents. The parents draw on material resources and set up spatial-temporal boundaries to ‘navigate’ urban heat in India and mitigate ‘thermal risks’ for their children. These diasporic lived experiences of urban thermal cultures are therefore embedded in material privileges and power. By capturing translocal lived experiences of heat in urban India, this paper pushes forward our emergent understandings of the social and cultural geographies of weather-worlds.

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